

# **Spot Safety Project Evaluation**

Project Log # 200702022

Spot Safety Project # 04-01-214

**Spot Safety Project Evaluation of Revising Traffic Signal  
Phasing to include protected lefts from US 70 and  
Extension of Westbound Left Turn Storage Lane  
At the Intersection of US 70 and SR 1242 (Perkins Mill Rd)  
Wayne County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Traffic Engineering and Safety Systems Branch  
North Carolina Department of Transportation

**Principal Investigator**

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Jason B. Schronce

5-4-2007  
Date

Traffic Safety Project Engineer

## ***Spot Safety Project Evaluation Documentation***

### **Subject Location**

Evaluation of Spot Safety Project Number 04-01-214 – The Intersection of US 70 and SR 1242 (Perkins Mill Rd) in Wayne County.

### **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the revising of the traffic signal phasing and the extension of the westbound left turn storage lane on US 70.

US 70 is a 4 lane divided highway with exclusive right and left turn lanes on both approaches of this intersection with a 55-mph speed limit. SR 1242 (Perkins Mill Road) is a 2-lane road that widens at the intersection with US 70 to provide a through-left and an exclusive right turn lane. SR 1242 has a speed limit of 45-mph. The northern leg of the intersection is the entrance to Jeffrey's Distributing, which is 2 lane. In the before period, the intersection was signalized with permissive left turns on all approaches.

The original statement of problem was that left turning vehicles on westbound US 70 were stopped in the through lanes due to congestion and that those same vehicles have difficulty seeing past the large trucks waiting to turn left into Jeffrey's Distribution. Also, the vehicles might have felt pressure to negotiate left turns without an appropriate gap in oncoming traffic during peak volume conditions.

The original proposed improvements at this intersection included offsetting the left turn lanes on US 70 to correct the sight distance issues and allow better optimization of current signal timing. In a letter dated March 7, 2002, the State Traffic Engineer requested a change from the original scope to "Extend the westbound US 70 left turn storage lane and revise the traffic signal for protected left turns on westbound US 70." The change occurred after repeated requests from Wayne County leaders and officials. The cost of the project was not altered after the change in scope was completed.

The initial crash analysis was completed from October 31, 1997 to October 31, 2000 with 35 reported crashes, including 14 that were considered correctable by the chosen countermeasures. The 14 correctable crashes included 1 fatality, 5 B-class, and 6 C-class injuries. The final completion date for the improvement at the subject intersection was on May 14, 2002 with a total cost of \$100,000.00.

### **Naive Before and After Analysis**

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from March 1, 2002 to July 31, 2002. The before period consisted of reported crashes from November 1,

1997 through February 28, 2002 (4 years and 4 months) and the after period consisted of reported crashes from August 1, 2002 through November 30, 2006 (4 years and 4 months). The ending date for this analysis was determined by the available crash data at the time the analysis was completed.

The treatment data consisted of all crashes extending 150 feet from each approach of the subject intersection.

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that target crashes are divided into two types of crashes. Left Turn Crashes, including U-turn movements, involving westbound US 70 vehicles that occurred in the intersection are the first type of target crashes for the applied countermeasure. Rear-End Crashes in the westbound US-70 left turn storage lane and in the adjacent through lane approaching the intersection are considered the second type of target crash due to traffic congestion in the storage lane overflowing into the through lane.

<b><u>Treatment Information</u></b>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	52	23	- 55.77 %
Total Severity Index	9.22	3.90	- 57.70 %
Target Crashes I (Left Turn)	27	0	- 100.00 %
Target Crash I Severity Index	11.20	0.00	- 100.00 %
Target Crash II (Rear-ends)	3	3	0.00 %
Target Crash II Severity Index	5.93	3.47	- 41.48 %
Volume	31,500	33,500	6.35 %
<b><u>Crash Severity Summary</u></b>			
Fatal Crashes	1	0	- 100.00 %
Class A Crashes	2	0	- 100.00 %
Class B Crashes	11	2	- 81.82 %
Class C Crashes	16	7	- 56.25 %
PDO Crashes	22	14	- 36.36 %

The naive before and after analysis at the treatment location resulted in a 56 percent decrease in Total Crashes, a 100 percent decrease in Left Turn Crashes, and no change in Rear-end Crashes. There was also a 58 percent decrease in the Total Severity Index and a 6 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2004.

## Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 56 percent decrease in Total Crashes, a 100 percent

decrease in Left Turn Crashes, and no change in Rear-end Crashes. The Total Severity Index decreased by 58 percent, the Left Turn Crash Severity Index decreased by 100 percent, and the Rear-end Crash Severity Index decreased by 41 percent. The summary results above demonstrate that Total Crashes and both types of Target Crashes appear to have decreased at the treatment location from the before to the after period.

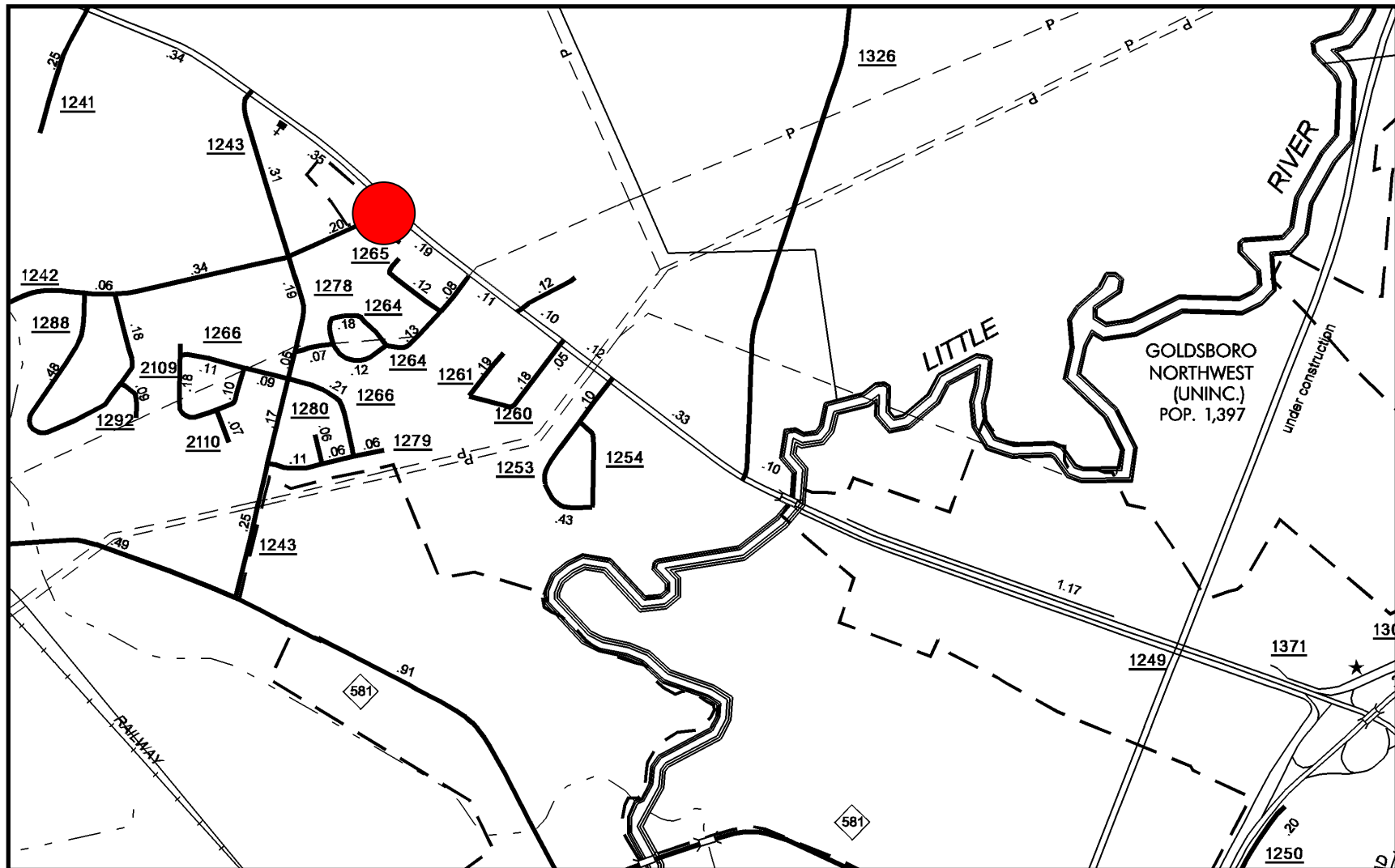
Referencing the *Collision Diagrams*, in the before period there was a large pattern of Left-Turn, Same Roadway Crashes for turning left from westbound US-70 onto SR 1242. This pattern has been completely eliminated in the after period. The expansion of the westbound left turn storage lane has provided vehicles with a refuge to wait in while vehicles traveling straight can continue uninterrupted.

The calculated benefit to cost ratio for this project is 28.09 considering total crashes. The benefit to cost ratio considering only target crashes is 20.34. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

**Location Map**  
**Wayne County**  
**Evaluation of Spot Safety Project # 04-01-214**



**Treatment Location: US-70 at SR 1242 (Perkins Mill Road)**  
**Northwest of Goldsboro, NC**

**Site Photos Taken April 12, 2007**



Looking WB on US-70



Looking WB on US-70



Looking NB on SR 1242 (Perkins Mill Rd)



Looking NB on SR 1242 (Perkins Mill Rd)





Looking EB on US 70



Looking SB from Jeffrey's Wholesale Warehouse



# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 at SR 1242 (Perkins Mill)  
COUNTY: Wayne  
FILE NO.: SS 04-01-214

BY: JBS  
DATE: 3/16/2007  
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - Signal Rephrasing, Extra storage in Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$100,000	10	0.149	\$14,903
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$100,000	10	0.149	\$14,903
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$200
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$150
TOTAL ANNUAL COST=	\$15,253
TOTAL COST OF PROJECT=	\$100,000

COMPREHENSIVE COST REDUCTION:

## ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.33	3	0.69	27	6.24	22	5.08	\$478,476
AFTER	4.33	0	0.00	9	2.08	14	3.23	\$50,023

Annual Benefits from Crash Cost Savings \$428,453

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$413,200

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 28.09

TOTAL COST OF PROJECT	-	\$100,000	COMPREHENSIVE B/C RATIO	-	28.09
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# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 at SR 1242 (Perkins Mill)  
COUNTY: Wayne  
FILE NO.: SS 04-01-214

BY: JBS  
DATE: 3/16/2007  
NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - Signal Rephrasing, Extra storage in Turn Lane

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$100,000	10	0.149	\$14,903
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$100,000	10	0.149	\$14,903
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$200
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$150
TOTAL ANNUAL COST=	\$15,253
TOTAL COST OF PROJECT=	\$100,000

COMPREHENSIVE COST REDUCTION:

## ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

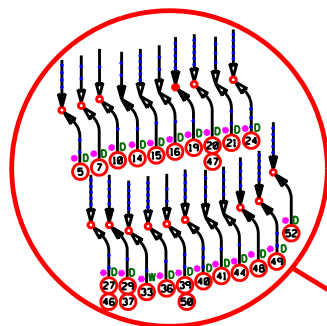
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.33	2	0.46	19	4.39	7	1.62	\$316,236
AFTER	4.33	0	0.00	1	0.23	2	0.46	\$5,958

Annual Benefits from Crash Cost Savings \$310,277

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$295,024

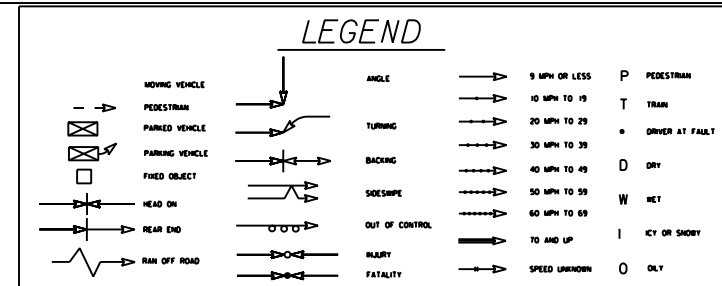
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 20.34

TOTAL COST OF PROJECT - \$100,000 COMPREHENSIVE B/C RATIO - 20.34



US 70  
55 MPH

To Nursing Home



# Target Crashes I

# Target Crashes II

SR I242  
Perkins Mill Rd  
45 MPH

Jeffery's Wholesale



SS# 04-01-214  
Wayne County  
Before Period  
11/1/97 - 2/28/02  
US 70 at SR I242



Signal Control  
All 4 Approaches

US 70

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 11/1/97 TO 2/28/02	
DISTANCE: 1-LINE = 150 FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: JBS	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 3-23-2007	
LOG NUMBER: 55-04-01-214	

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY**  
**SYSTEMS BRANCH**

Kangaroo Gas Station

SR 1242  
Perkins Mill Rd  
45 MPH

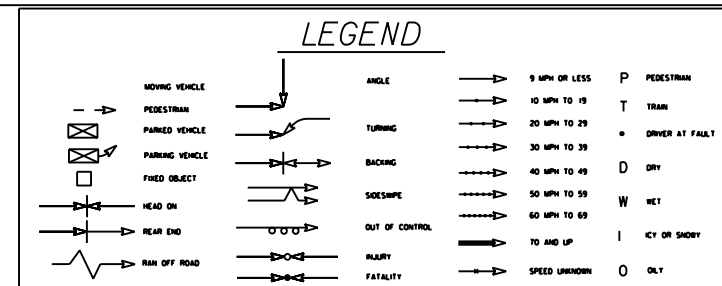
US 70  
55 MPH

To Nursing Home

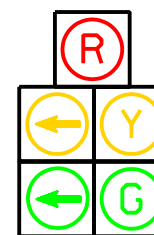
Jeffery's Wholesale

US 70

- After Period Modifications:
1. Add Left Turn Lane Storage capacity on WB US-70
  2. Revise Signal from permissive to protected left turns on SR 1242 from WB US-70



SS# 04-01-214  
Wayne County  
After Period  
8/1/02 - 11/30/06  
US 70 at SR 1242



- # Target Crashes I
- # Target Crashes II

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

COLLISION DIAGRAM	
DIVISION: 4	AREA:
STUDY PERIOD: 8/1/2002 TO 11/30/2006	
DISTANCE: 1/4 MI. - 1/2 MI.	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: JBS	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 3-23-2007	
LOG NUMBER: SS# 04-01-214	

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY**  
**SYSTEMS BRANCH**